



INTRODUCTION TO ECONOMICS. THE IMPACT OF TECHNOLOGY ON THE LABOUR MARKETS

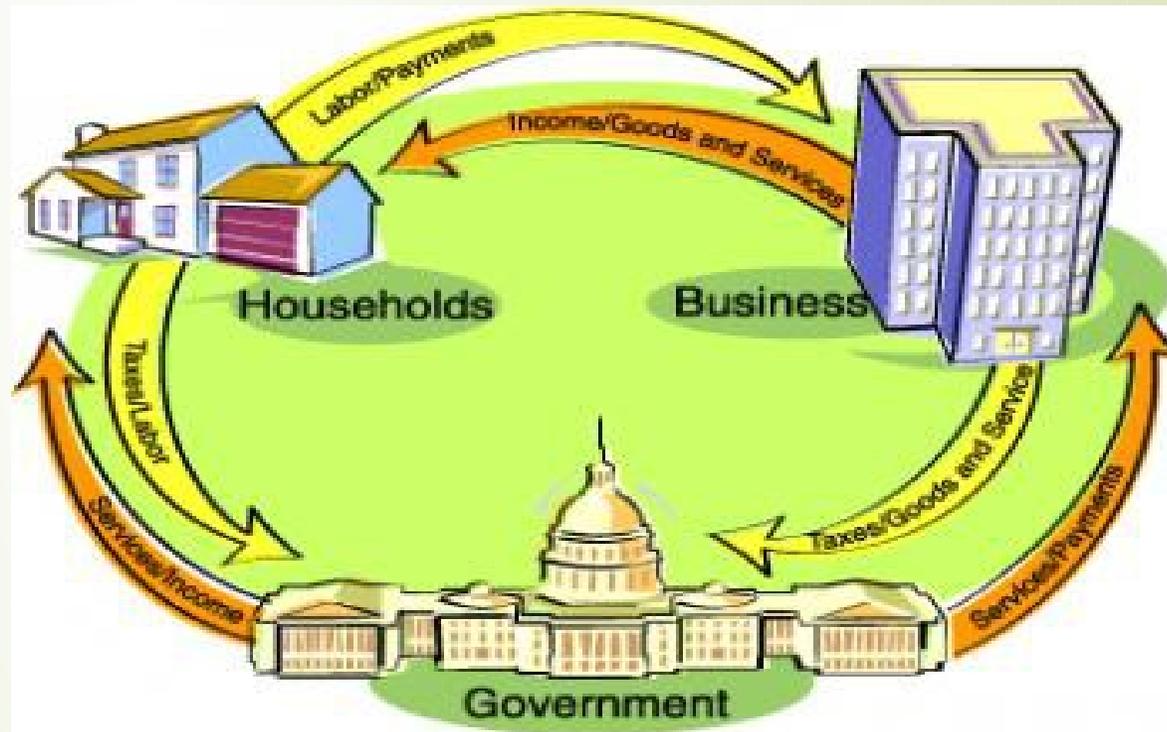
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Contents

- 
- Short overview of economic theory
 - Short historical overview
 - Group exercise
 - The future of work: values and expectations
 - Trends in the future of work
 - Industry 4.0
 - Robotics
 - Drones
 - 3-d printing
 - Artificial Intelligence
 - The sharing economy
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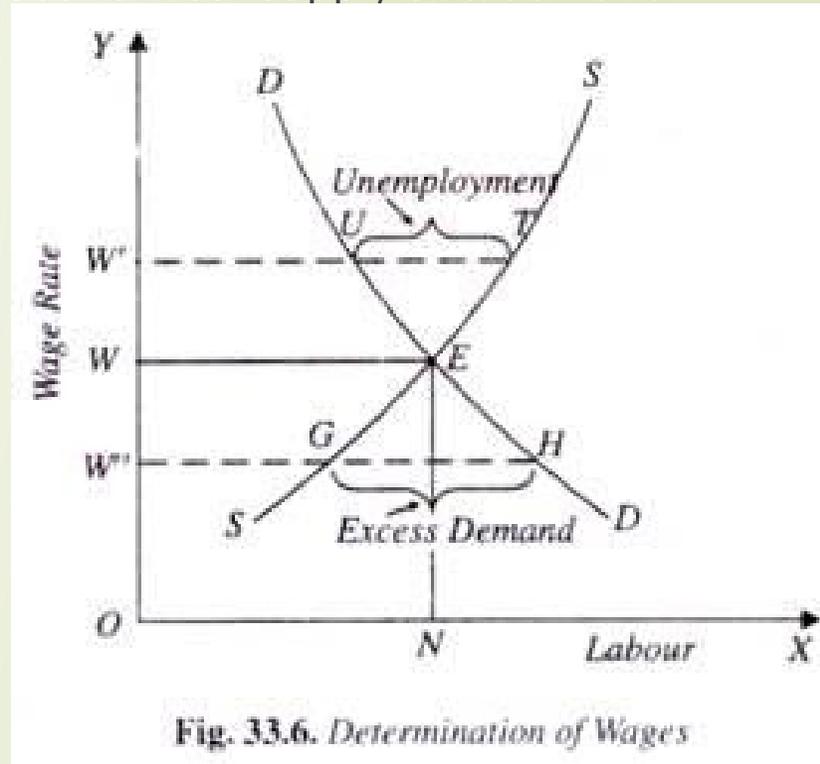
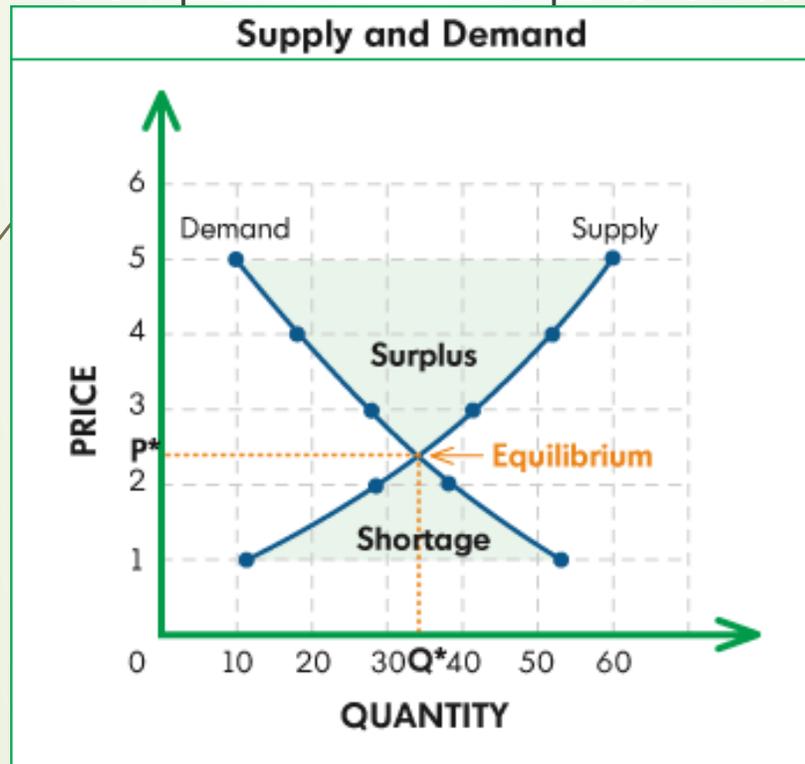
What is economics?

- Classic economic textbooks say it is the study of human action regarding decision-making in the context of unlimited wants and scarce resources.
- It is a study of incentives. Question: what is the appropriate level of government intervention and its effect on incentives? Socialism was blamed for disincentivising people, as it advocated: from each according to their ability, to each according to their needs.
- Classical economists consider people are always rational when making decisions; behavioural economists take into account psychological factors that influence them (Daniel Kahneman, *Thinking Fast and Slow*)



Economic models

- Economists use models in order to understand concepts and to make predictions. Models use quantitative and qualitative data. Question: why are economists' predictions always wrong? What is the use of models if their predictive value is often unreliable? What do you think of a mathematical formula for length of marriage?
- Three factors of production: capital, land, labour
- The simplest and most important model in economics: supply and demand



Technology and the labour markets

➤ Cobb Douglas Production Function

$$Y = AK^\alpha L^{1-\alpha}$$

Where: Y=output, A=total factor productivity (technology), K=capital, L=labour

The rationale behind this formula is that an industry, country or production unit can be capital abundant or labour abundant, an increase in one means a decrease in the other.

➤ Why is this important?

If A doubles, Y doubles as well

Y doubles if both K and L double

➤ It means that an increase in technology has a vastly larger effect on output than an increase in population and/or capital

➤ The concept of creative destruction: in order to create a new way of life, the old ways are left behind, this almost always affects the social fabric: rise in unemployment, migration, loss of sense of belonging to the community, growth in inequality.

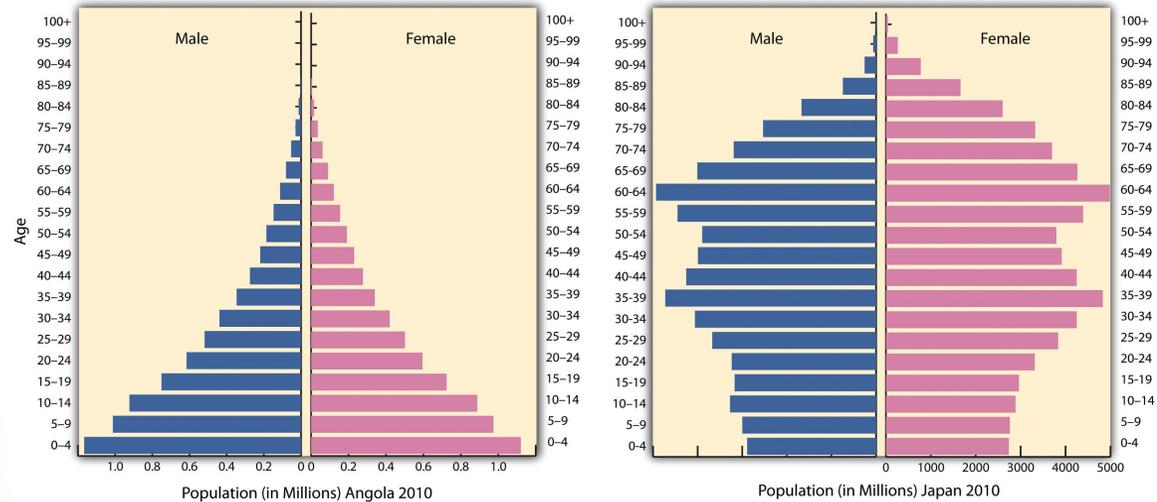
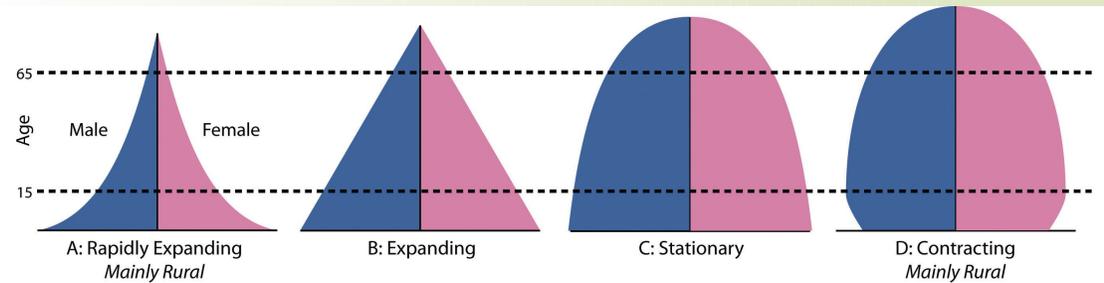
➤ Inequality is a very fashionable subject amongst economists. In the mid 20th century, they were concerned with inflation and unemployment and thought there was an inverse relationship between the two. That is until stagflation happened in the 70's, which meant rise in incomes and unemployment at the same time.

➤ In the middle of the 20th century, social thinkers believed technological revolution was going to relieve man from repetitive and tedious work. He will have more time for leisure as well as the opportunity to dedicate himself to meaningful work, pursue his passions and personal growth. We can agree that this hasn't happened. Why?

Employment and population growth

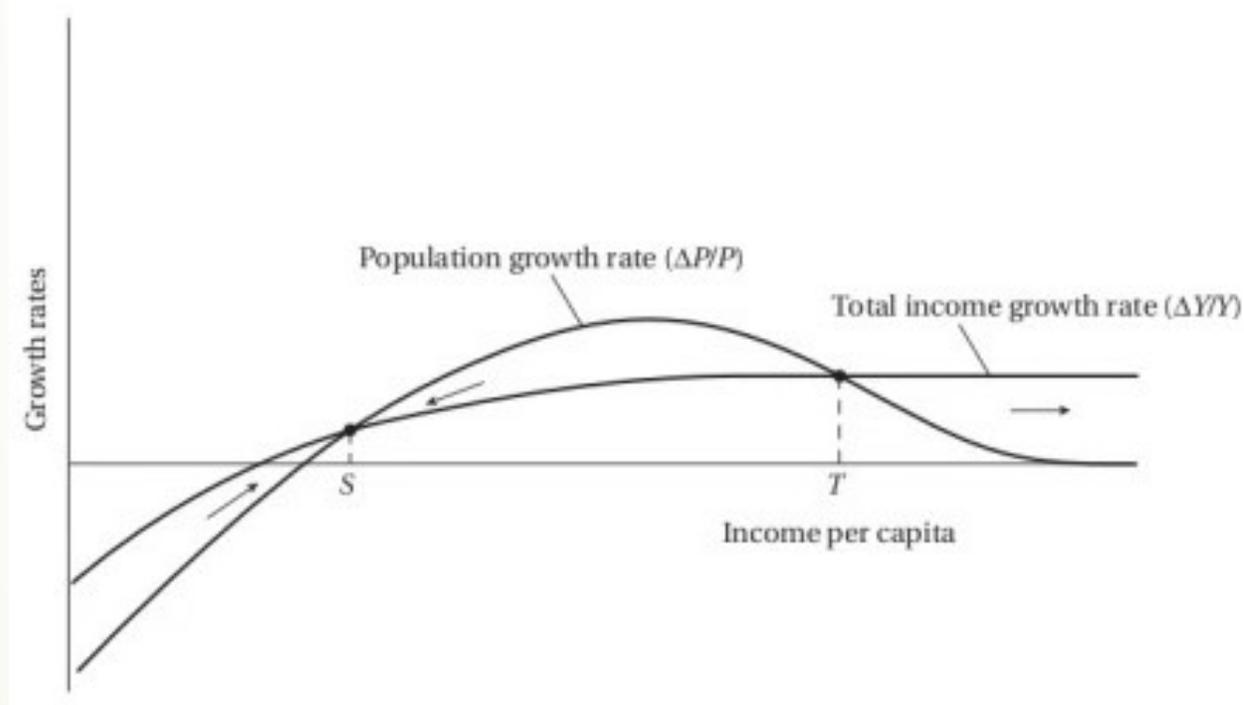
High population growth is a prerequisite for unemployment in a fast-paced technological changing environment.

- Low population growth and an aging population means concerns about how to provide for the retired (in Britain they are testing Automatic Enrolment into private pensions scheme). Is immigration a possible answer?

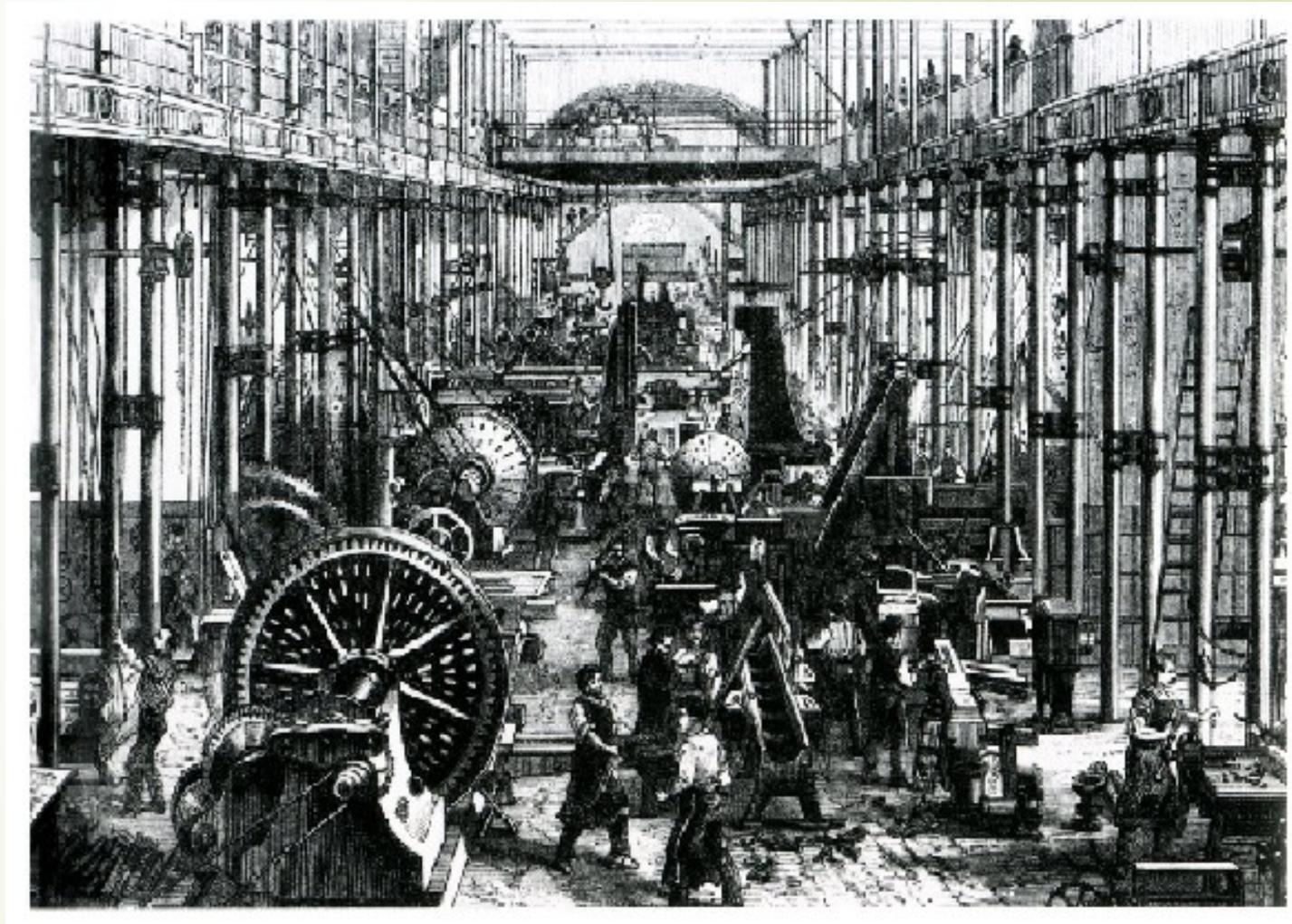


Population grows exponentially, while food production grows arithmetically. Technological progress changed this assumption.

- Population growth is correlated to income growth, but there are limitations.
- The poverty trap:
 - low population growth starting from a low income point results in growth in income
 - high population growth starting from a low income point results in a decrease in income
 - low population growth starting from a high income point results in growth in income



- When has a technological revolution had an unprecedented transformational effect on society?



Societal effects of the industrial revolution

- Winners and losers of the advent of technological progress: capital and land owners gained, whereas the suppliers of labour were losing their economic independence and relied on factory owners for employment. Craftsmen were becoming obsolete as factories produced the same goods more efficiently, both cheaper and faster.
- Rise in unemployment. As we have seen from the demand and supply model, an excess supply of workers leads to a decrease in wages. Consequently, the number of poor people increased.
- Growth in trade, competition from abroad.
- Political unrest: ex. The French Revolution
- In England, the adoption of Speenhamland (1795). The law intended to provide social protection to the poor, meaning each person was entitled to subsistence, which meant the state was completing the wages when they were too low to live on. Although it was hugely popular, it had disastrous effects: it incentivised employers to pay very little and productivity decreased. The hardest hit were the 'deserving poor', those who owned a little land and therefore were not eligible for the rates. Employers were not able to select the most suitable workers. It meant pauperisation of workers, as they ended up having a subsistence income and was abolished in 1832. While population increased three-fold, rates increased twenty-fold.
- Today, some social scientists advocate the introduction of a Universal Basic Income. What are the effects likely to be? Also consider that researchers in natural sciences studied animal behaviour and discovered they prefer to earn their food even if given the chance of it being readily available.

- The exercise lasts for 20 min. You will form groups of two and will receive an envelope containing fake money and the necessities for producing an output of geometrical shapes. Note that not all envelope contents are identical and you are allowed to trade or rent utensils from other groups. After you complete a shape or group of shapes, you will bring them to me to check for quality control and, if the products meet standards, will receive payment. Prices may change over the course of the exercise.
- The products you need to produce are:
 - equilateral triangle with 3 cm sides, worth 10M
 - rectangle with the length of 7 cm and width of 4 cm, worth 15M
 - a circle with a radius of 8 cm, worth 30M
 - a triangle with sides of 3.5 cm, 8 cm, 8.7 cm, worth 50M
- The group with the highest amount of money at the end of the exercise wins.
- What have you learn from this exercise? How would the introduction of technology change the outcome

➤ Traditional thinking

Hard work → Career Success → Happiness

How it actually works:

Happiness → Career Success

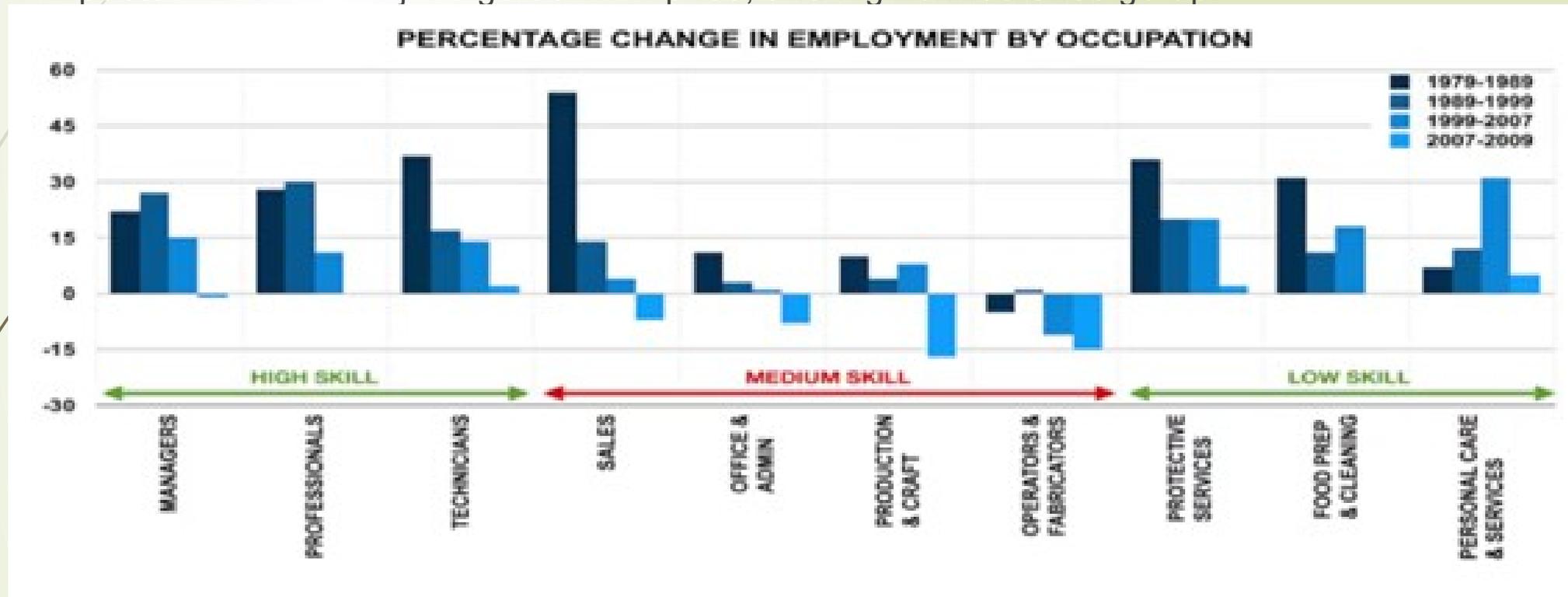
- Why? Work is increasingly demanding more creativity and problem-solving skills.
- Higher wages (also called efficiency wages) worked wonders in the Ford plant in 1914, whereas a study involving solving skills showed a very high payment actually decreased performance.
- What do employers say about the skills they think are going to be paramount in the future? Intuition. Creativity. Persuasion. These skills aren't taught in schools, although some forward thinking institutions are beginning to be aware of this shortcoming (example: QModel).
- Competition needs to be replaced by a standard of collaboration and cooperation.
- Traditional thinking:

Work → Make money → Buy things → Happiness

A need for a new paradigm, where work in itself is fulfilling. Another study asked people to build bionicles in meaningful vs. Sisyphean condition. They build 11 vs. 7 and love for building lego models was uncorrelated in the second condition. Meaning is paramount to motivation.

Trends in the future of work

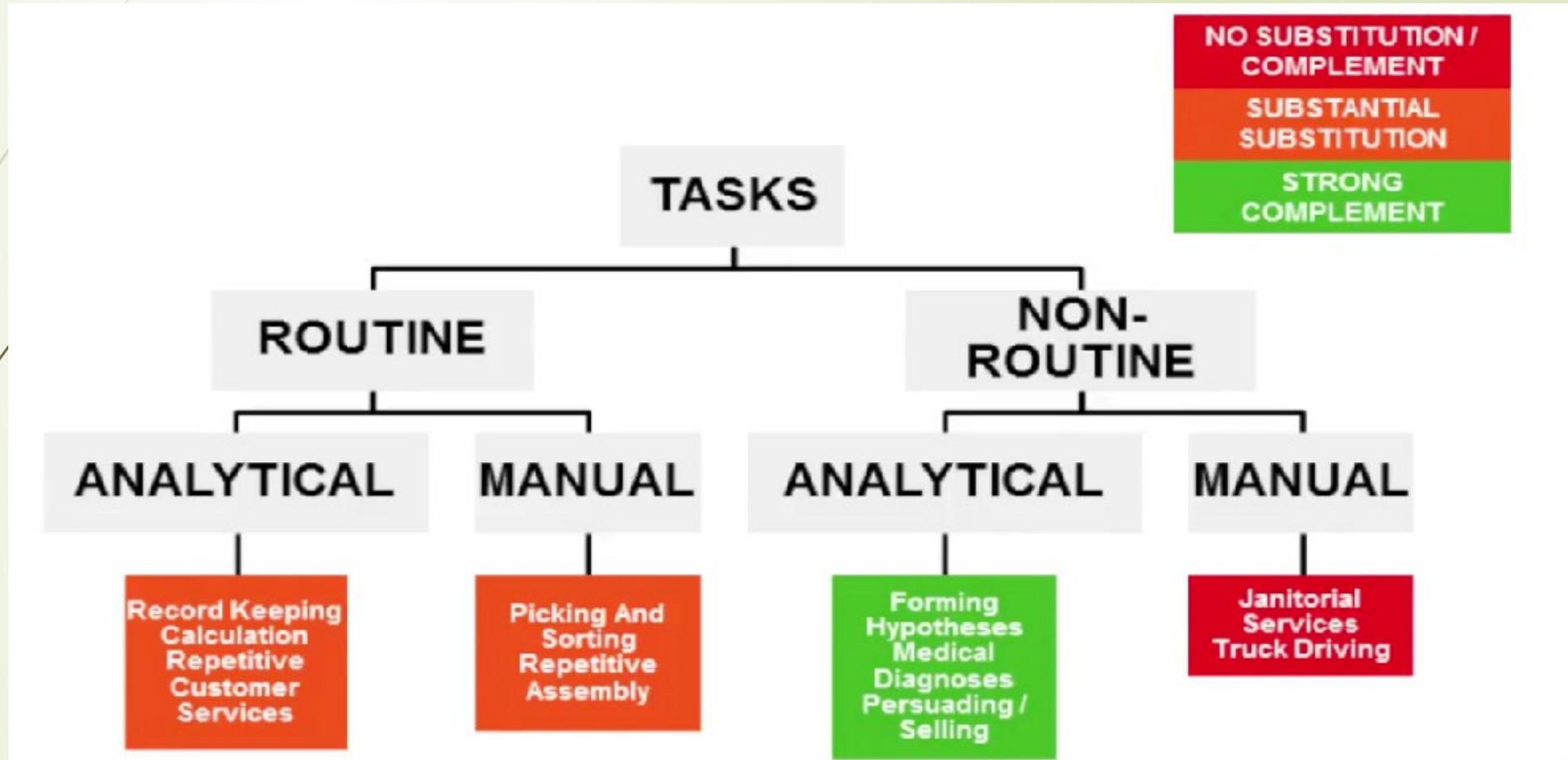
- 1. As a result of globalisation, the talent of people will widen. At the same time, talented people are being attracted to clusters in the biggest cities around the world.
- 2. There will be profound changes in valuable skills. Moravec's paradox. Medium skilled work is the most impacted. Low skilled jobs go down in price, and high skilled ones go up.





Trends in the future of work

- What skills can't be atomised? Complex problem-solving, interpersonal interactions, situational adaptability.
- Artificial Intelligence (AI) will augment work.



Trends in the future of work

- 3. People are living longer and working longer.
- 4. Different life stages emerge. People will change careers more often and will take time off work for full-time education keep up to date. They will also explore more and be more likely to embark on an entrepreneurial endeavour.
- 5. Societal trends: changing attitudes to work/life. Technology blurs the distinction work – home.



Trends in the future of work

6. Changing attitudes towards assets.

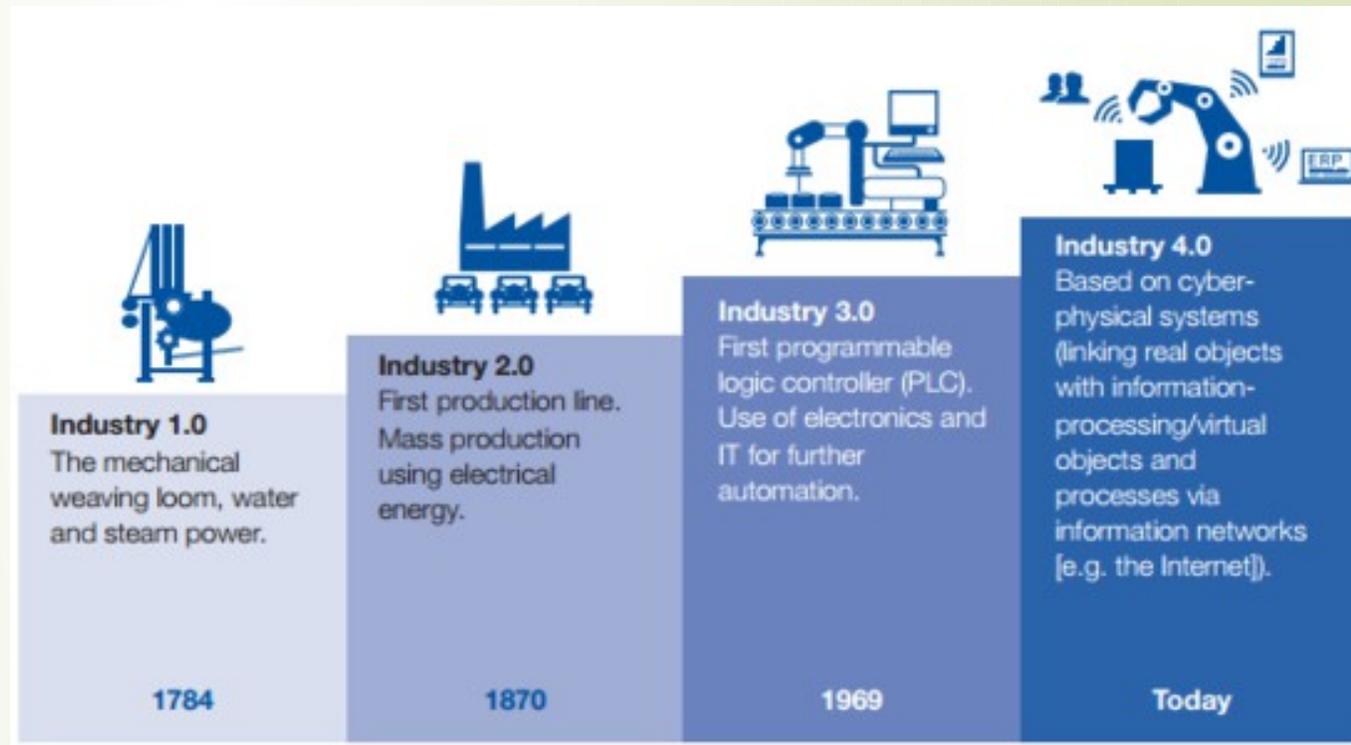


- What is the personality trait that employers mention the most?
- Low growth economy and shifting in incentives.
- The growing importance of social capital: posses (people just like you), weak links bring about opportunities and regeneration.



Industry 4.0

- ▶ A study by PwC predicts that, in five years' time, 80% of companies will have digitised their value chain.
- ▶ The biggest increases will be in manufacturing: supply chain, product development and engineering; automotive and process industries; electronics and electrical systems; services; distribution and information & communication.
- ▶ It can be used in medicine and save lives, i.e. adding sensors to a stent* which helps monitor patients.



- ▶ What is the impact on our daily lives and on the labour markets?

* A stent is an implant that is inserted into a patient's artery to improve blood flow. What's interesting about these devices is they are positioned in a major artery and are therefore useful in delivering medication on a gradual basis to certain patients.

Artificial Intelligence (AI)

- Alain Turing (1912-1954) is considered to be the father of theoretical computer science and artificial intelligence. He invented the Turing Machine, a rudimentary computer (1936) and devised techniques for breaking the German ciphers, including improvements to the Enigma Machine. This work is estimated to have shortened the war by two years and saved 14 million lives.
- Can a computer pass the Turing Test? The Turing Test is successfully passed if a computer is mistaken for a human more than 30% of the time during a series of five-minute keyboard conversations. A computer called Eugene Goostman, who simulates a 13-year-old Ukrainian boy, is said to have passed the test on 7 June 2014 at an event organised by the University of Reading. It convinced 33% of the judges at the Royal Society in London that it was human.
- Intelligence can be generally described as the ability to perceive information, and retain it as knowledge to be applied towards adaptive behaviours within an environment or context.
- How do machines learn? They learn from experience: artificial neural networks and deep learning.
- In addition to speech recognition and natural language (processing, generation, and understanding) applications, AI is also used for other recognition tasks (pattern, text, audio, image, video, facial), autonomous vehicles, medical diagnoses, gaming, search engines, spam filtering, crime fighting, marketing, robotics, remote sensing, computer vision, transportation, music recognition, classification, and so on.

<http://www.bbc.co.uk/news/technology-27762088>

Robotics

- The word *robot* comes from the Slavic word *robota*, which means labour.
- Uses: domestic, industrial, farming as well as in dangerous environments, such as bomb detection and deactivating.
- Commercial and industrial robots are widespread today and used to perform jobs more cheaply, more accurately and more reliably, than humans.
- They are also employed in some jobs which are too dirty, dangerous, or dull to be suitable for humans.
- Robots are widely used in manufacturing, assembly, packing and packaging, transport, earth and space exploration, surgery, weaponry, laboratory research, safety, and the mass production of consumer and industrial goods.
- Brief history
 - 1942 - science-fiction writer Isac Asimov formulated the Three Laws of Robotics.*
 - 1948 – Norbert Wiener formulated the principles of cybernetics, the basis of practical robotics.*
 - 1961 - the first digitally operated and programmable robot, the Unimate.

- What is the impact on human life and labour demand?

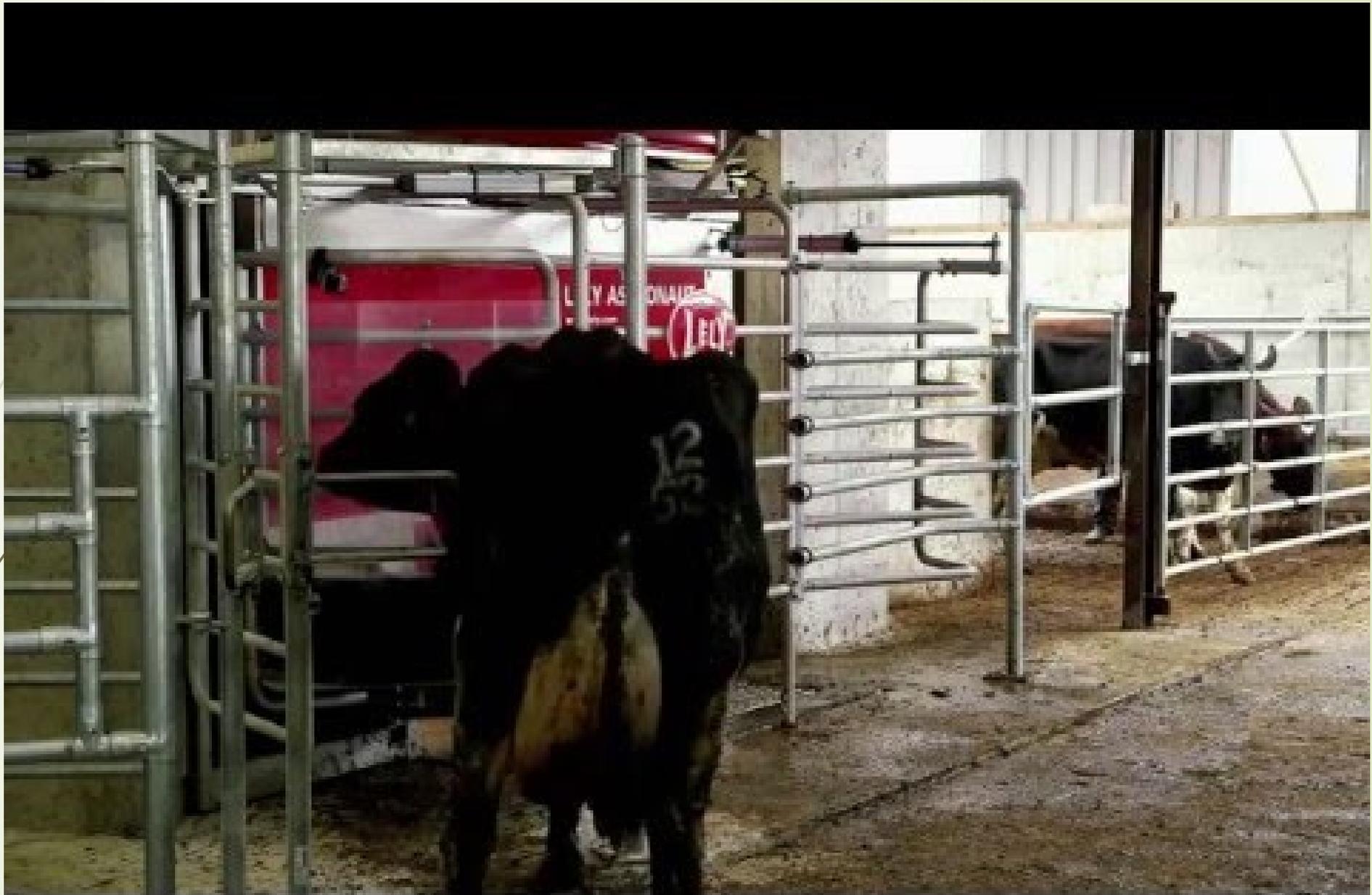
*1. A robot may not injure a human being or, through inaction, allow a human being to come to harm. 2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law. 3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws

*Cybernetics is a transdisciplinary approach for exploring systems: their structures, constraints, and possibilities. Today it is understood as control of systems using technology. Concepts studied by cyberneticists include, but are not limited to: learning, cognition, adaptation, social control, emergence, convergence, communication, efficiency, efficacy and connectivity.



iRobot





Drones

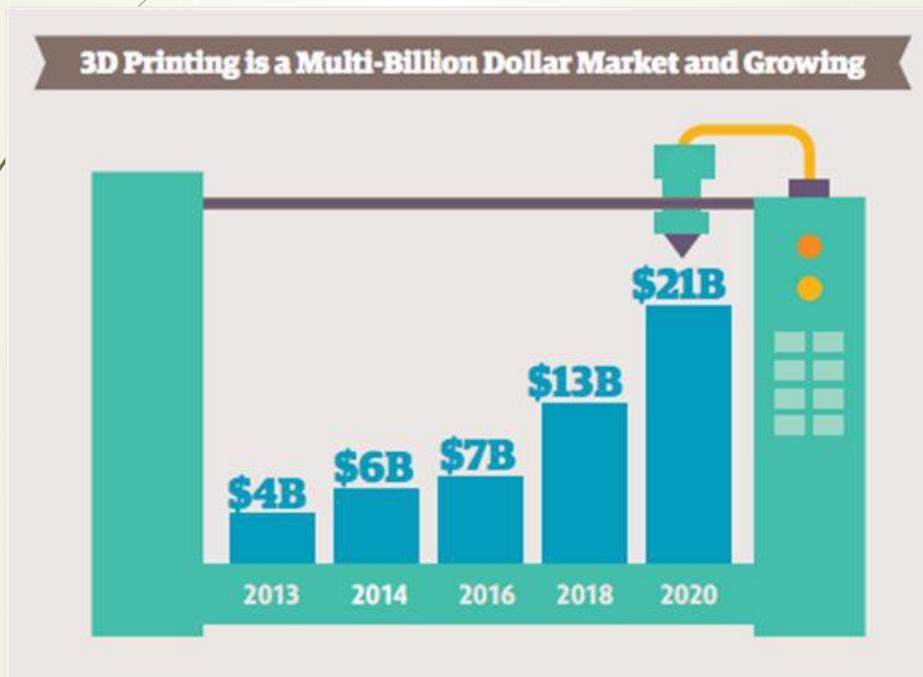
- From agriculture to filmmaking, the global market for drones is valued at \$127 bil.
- Benefits: high speed, excellent payload capacity (=gross vehicle weight capacity – curb weight), accessibility, delivery of high quality, real-time data in a cost-effective way.
- They are used in infrastructure, agriculture, transport, security, media & entertainment, insurance, telecommunication and mining.
- Software drones are able to perform flights without a human pilot, they can navigate through dark, indoor and off-grid environments. The sensor fusion and AI provide drones with a situational awareness. Multiple sensors enable drone to create a 3D map and update it after take-off. Human engagement during the flight is limited only to giving drone a goal and starting location.
- The new software could help drones to count inventory in warehouses, to work in dark mine shafts and unfinished buildings and to measure work productivity. But in the real world autonomous drones not only have to avoid pedestrians, urban obstacles and obey traffic laws but also they need to face the challenge of internet connectivity problems.
- The Dubai Road and Transport Authority plans to introduce drone taxis as early as this summer – in July 2017. The innovative flying taxis are expected to fly from point A to point B and the passage will not need to have any skills related to piloting the drone. All will work automatically. The taxis will be able to fly up to 30km at a maximum speed of 60km/h and carry up to 100kg, so on average one person with a small luggage.
- The European Commission is planning to implement rules for operations of small drones within European Union area. The goal of EC is to “make drones part of the European citizens’ daily lives by 2019.”
- Entertainment: Drone 100 Lights Up





3-d printing

- ▶ 3-d printing is seen as the 'next big thing', changing our lives and the way the products we consume are made on a scale comparable to the introduction of the steam engine or the computer.
- ▶ It is quick, cost-effective and uses computer modelling and additive manufacturing processes.
- ▶ Healthcare is set to be a big winner from 3D printing, with hearing aids, prosthetics and implants already transforming the space. Some products, such as 3-d printed prosthetics are not yet as reliable as traditionally made ones, but technology is evolving fast.





3D PRINTING

The sharing economy

- ▶ Companies such as Air BnB, Uber, Spotify, Task Rabbit are becoming increasingly popular. The sharing economy matches consumers with people who have underutilised assets or are willing to provide services on an ad-hoc basis. Both parties gain: consumers from generally lower prices and more flexibility and providers from the income they wouldn't otherwise obtain.
- ▶ Technology has reduced transaction costs, making sharing assets cheaper and easier than ever—and therefore possible on a much larger scale. The big change is the availability of more data about people and things, which allows physical assets to be disaggregated and consumed as services.
- ▶ Websites match up owners and renters; smartphones with GPS let people see where the nearest rentable car is parked, social networks provide a way to check up on people and build trust, and online payment systems handle the billing.
- ▶ Concerns that the sharing economy is trending towards traditional business models, i.e. people buying cars just to rent or listing their flat on Air BnB, instead of making it available for long-term rent, as well as regulatory uncertainty, such as taxing.
- ▶ The global sharing economy is worth \$15bn per year, according to PwC, and is projected to soar to \$335bn in 10 years.
- ▶ Between 2012 and 2015, 10.3m people made money from the sharing economy. Over the three years, that number increased 47-fold.



The
“Sharing
Economy”



**Thank you for your participation
and contribution !**